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# EVALUATION OF FOMES ANNOSUS STUMP INFECTION ON THE CANNELL MEADOW RANGER DISTRICT, SEQUOIA NATIONAL FOREST

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## ABSTRACT

In a survey of 10- to 20-year old stumps in the eastside pine, mixed conifer, and red fir types of the Cannell Meadow District, 31% of the Jeffrey pine stumps and 33% of the true fir stumps were infected with Fomes annosus. Stump infection in individual stands varied from 7% to 67%. Left uncontrolled, such a high rate of stump infection could result in a 30% loss of productive land in pine and mixed conifer stands, and increased mortality, butt decay, and windthrow in true fir stands. Alternatives to reduce and control these losses include borax treatment of pine stumps, planting pine in mixed conifer stands with high levels of annosus in fir stumps, and maintaining vigorous growth of true firs.

## INTRODUCTION

In February of 1984, Forest Pest Management pathologists met with Forest and District silviculturists from the Sequoia National Forest to discuss root disease problems and concerns. At this meeting several action items were proposed and assigned. One of these assignments to FPM was to evaluate the levels of F. annosus stump infection in the major timber types on the Cannell Meadow District. Recent District surveys of pending sales had indicated an unusually high rate of F. annosus stump infection in the eastside pine and mixed conifer types.

During the week of July 23 to 27, Dick Smith, FPM pathologist, met with Robert Iwamoto, District silviculturist, and they jointly surveyed for F. annosus infected stumps in several stands on the District which had been logged 10 to 20 years earlier.

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Starting in the southern part of the District at Bartolas Flat and moving north through Osa Meadow, they arbitrarily selected starting points in previously logged stands and ran a one-chain wide strip survey for 20 to 40 chains out in one of the 4 cardinal directions. In this survey all Jeffrey pine and true fir stumps over 12" in diameter were examined for the presence of F. annosus. Dead and dying trees around these stumps also were noted. If F. annosus conks were found in or on the stump, the stump was tallied as infected; if no conks were present, it was tallied as not infected. Information on the kind of surrounding vegetation was also taken. A minimum of 25 stumps was examined on each survey strip. In most cases the stumps had to be broken apart in order to find the conks.

Three strips were run through the eastside pine type in Bartolas Flats and Rattlesnake Meadow; two strips in the mixed conifer near Long Meadow and Dry Lake; and three strips in the red fir type near Osa Meadow and Sherman Pass.

## OBSERVATIONS

The results of these eight surveys are shown in the enclosed table. In general we found the rates of stump infection to be quite high. In most cases the overall stump infection rate was above 20% and as high as 70%. The average rate of stump infection for the District was 32% for all species, 31% for Jeffrey pine, and 33% for true firs.

Past experience indicates that pine stumps are infected shortly after pines are felled, and infection occurs through freshly cut stump surfaces. Infection of fir stumps can occur in a similar manner, but our observations of the old growth red fir on the Cannell Meadow District show that the trees were already infected by F. annosus at the time of felling. F. annosus acts as a root and butt rotting organism in true fir. Most of the infected true fir stumps had hollows and old decay pockets in the stumps which indicated that they were infected before falling. These differences in the infection times of the stumps require different pest management approaches in order to prevent or reduce losses.

## CONCLUSIONS

These are unusually high rates of stump infection when compared to the rates we normally find in the northern and central Sierra Nevada. Moreover, we consider these estimates to be conservative because we counted only those stumps with conks as being infected. Stumps which did not contain conks but had other less reliable indicators, such as the characteristic laminated decay, were not counted as infected. This unusually high rate of stump infection will result in high levels of seedling and sapling infection and unacceptable losses if steps are not taken to prevent stump infection and tree death.

The level of Jeffrey pine stump infection was as high in the mixed conifer forest type as in the eastside pine type. This is a situation which we did not expect because we find very low levels of pine stump infection in mixed conifer stands on the westside of the central Sierra Nevada.

In pine stands, with no spread of the disease outside of the areas occupied by the infected stumps and root systems, we would estimate that at least one-third of the area would be taken out of production for 20 or more years (Tree mortality on the Kern Plateau is still occurring around stumps cut 20 years ago.)

In true fir stands, some sapling and pole mortality may occur in overstocked stands around infected true fir stumps. Root and butt rot will affect one-third of the true fir stand. This root and butt rot will predispose trees in overstocked situations to attack by the fir engraver, will result in some volume loss due to heart rot in the butt log, and will result in some windthrow. The actual volume losses are difficult to determine because these effects are strongly influenced by stocking levels, tree growth, and intensity of forest management.

## MANAGEMENT ALTERNATIVES

Borax Pine Stumps

Treat all Jeffrey pine stumps in all forest types with borax at the time of cutting. The high levels of Jeffrey pine stump infection in both the eastside pine and mixed conifer types indicate that it is likely that at least one-third of the pine stumps will become infected. Spread of the infection from these stumps to new seedlings and saplings in the immediate vicinity of the stump will keep the immediate area barren of conifer reproduction for at least 20 years and probably more. By treating the pine stumps with borax the forest manager can reduce pine stump infection by 95%. Because of the consistently high levels of Jeffrey pine stump infection found in both the eastside pine and mixed conifer stands on the District one should expect such high levels on all sales in these types. Therefore stump surveys of individual sales are unnecessary to determine the need for stump boraxing.

Our observations on the District indicate that there is a high rate (33%) of true fir stumps infected, and that most of these true fir stumps were infected prior to the time the trees were cut. Therefore we estimate that 1/3 of mature true firs are already infected and do not believe that boraxing of true fir stumps would be an effective preventive treatment for F. annosus.

Plant pine in mixed conifer types.

In mixed conifer stands where Jeffrey pine is a normal component of the stand, Jeffrey pine could be planted back where there are indications of high levels of true fir infection. Observations indicate that there is little or no spread of F. annosus from infected true fir stumps to surrounding pine seedlings, saplings, and poles.

Encourage rapid growth of true firs.

Observations in mixed conifer and true fir stands indicate that most F. annosus-caused true fir mortality around true fir stumps occurs where the fir are under stress, such as from overstocking. Death is usually preceded by a long period, 10 to 20 years, of very slow growth and usually involves the fir engraver beetle in the last stages. Evidence is that F. annosus is very slow in its advance through true firs roots and root crown particularly in the

sapwood and that fast growing vigorous trees can be infected but little affected by this disease. Therefore those management practices that encourage and maintain moderate to fast growth of true firs hold the most promise of reducing losses due to F. annosus.

| PLOT NO. | FOREST TYPE | STUMPS SAMPLED | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | ALL SPECIES | | | JEFFREY PINE | | | TRUE FIR | | |
| | | NO. SAMPLED | NO. INFECTED | % INFECTED | NO. SAMPLED | NO. INFECTED | % INFECTED | NO. SAMPLED | NO. INFECTED | % INFECTED |
| 1 | EP | 49 | 9 | 18 | 49 | 9 | 18 | — | — | — |
| 2 | EP | 28 | 2 | 07 | 28 | 2 | 07 | — | — | — |
| 3 | EP | 29 | 15 | 52 | 29 | 15 | 52 | — | — | — |
| 4 | MC | 27 | 18 | 67 | 23 | 16 | 70 | 4 | 2 | 50 |
| 5 | MC | 25 | 11 | 44 | 12 | 2 | 16 | 13 | 9 | 69 |
| 6 | RF | 25 | 9 | 36 | — | — | — | 25 | 9 | 36 |
| 7 | RF | 25 | 5 | 20 | — | — | — | 25 | 5 | 20 |
| 8 | RF | 26 | 6 | 23 | — | — | — | 26 | 6 | 23 |
| | | 234 | 75 | 32% | 141 | 44 | 31% | 93 | 31 | 33% |